EERA
European Energy Research Alliance
Energy Efficiency in Industrial Processes

Policy brief

THE ROLE AND IMPACT OF ENERGY EFFICIENCY IN DECARBONISING EUROPEAN INDUSTRY

The European Energy Research Alliance Joint Programme for Energy Efficiency in Industrial Processes (EERA JP EEIP) published a White Paper on "*The Role and Impact of Energy Efficiency in Decarbonising European Industry*". This Briefing summarises the policy recommendations from the paper.

Setting the scene

As industrial activity continues to grow in most industrialised nations, so will power consumption, necessitating urgent action to reduce greenhouse gas emissions in line with climate goals for 2030 and 2050. While a green transition is vital, barriers such as limited renewable capacity and infrastructure constraints make energy efficiency a crucial strategy. **By improving energy efficiency, industries can reduce demand for renewable energy, ease grid pressure, and lower costs, making the transition more feasible and affordable.**

Energy efficiency is often the most cost-effective and immediate decarbonisation strategy, particularly for industrial sectors. It helps reduce energy use, reduces CO2 emissions, and enhances economic competitiveness. Implementing energy-efficient technologies—such as energy-efficient processes, waste heat recovery, and optimised cooling—can yield substantial benefits. Moreover, digitalisation and process integration can improve decision-making and energy use. Despite ongoing efforts, the full potential of energy efficiency in industry remains untapped and should be a key focus for policymakers to accelerate the green transition.

Methods and potentials to increase energy efficiency

Energy efficiency improvement in industrial processes is defined as using less energy to generate the same product, both in terms of quality and quantity.

Energy-efficient industries utilise less fuel, heat, cold, steam, etc., thus reducing their energy consumption and associated greenhouse gas emissions, while also saving money on energy costs. This can be achieved through a range of measures, such as optimising processes, upgrading equipment, avoiding or recovering waste heat, improving insulation, recycling, digitalisation, automation, knowledge exchange and training.

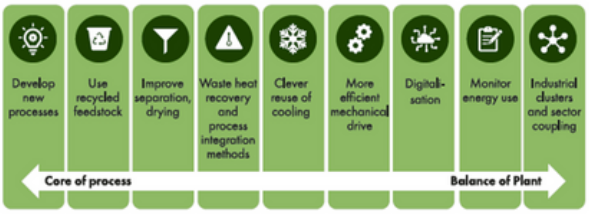

FIGURE 1

Measures to improve energy efficiency in industrial processess

Best Available Technologies (BAT)

Implementing the **Best Available Technologies (BAT) for energy efficiency has significant potential to reduce energy demand in industrial processes.** A wide adoption of BAT for energy efficiency across all industrial sectors and an increased recycling rate can reduce the industrial energy demand in 20250 by up to 23% [1]. BAT Reference documents, also called BREF, exist for all industrial sectors. These recommendations are technologies, processes, methods, and techniques that already exist and have been approved by legislators or regulators for meeting output standards for a particular process, such as pollution abatement. As can be expected, these BREFs are constantly developing as technology improves and regulations evolve. However, they are not updated as quickly as technology improves, and the recommendations can be fragmented when it comes to energy efficiency.

[1] Kermeli et al. 2022

Challenges and barriers to energy efficiency

Despite its potential, the adoption of energy efficiency technologies is hampered by different factors. Several barriers can impede the successful implementation of energy efficiency measures in industrial settings. These barriers can vary depending on the industry and specific circumstances, but some common ones include high upfront costs and reluctance to lock-in investments and limited funding options, regulatory barriers, retrofitting challenges, and lack of information and awareness.

Changes to policy in these areas are required if we are to achieve the benefit that energy efficiency offers for carbon emission reduction across European industry. It should support the development and demonstration of Best Available Technology (BAT) standards, as well as an information-sharing platform for energy-efficient practices across all sectors.

Demonstration projects for high-TRL energy efficiency measures should be encouraged to de-risk and offset first-mover costs, with monitoring and dissemination of results. Additionally, the policy should provide a clear vision for the future availability of renewable energy and require industries to create long-term decarbonisation plans up to 2050, ensuring alignment with the "energy efficiency first" principle. Sector-specific industrial roadmaps and the development of low-TRL innovative energy efficiency measures should also be supported to facilitate the transition to climate neutrality.

High upfront costs and limited funding options

- Many energy efficiency upgrades require significant capital investment, which can be difficult for companies to justify if they don't see immediate returns.
- Even when companies recognise the benefits of energy efficiency, they may not have access to the necessary financing to implement upgrades.

Regulatory and policy barriers

- Some regulations or policies may actually discourage energy efficiency, either by imposing additional costs or by creating incentives for companies to continue using traditional, less efficient technologies.
- Also, many times the constant changes in regulation lead to legal insecurity for enterprises, making it difficult to shape consistent business cases for large energy efficiency projects.

Retrofitting challenges and lack of necessary infrastructure

- Retrofitting older industrial facilities with energy-efficient technologies can be challenging due to compatibility issues and the need for modifications that may cause downtime.
- Companies may be risk-averse when it comes to implementing new technologies or processes, especially if they are uncertain about the potential returns on investment.
- Uncertainties in the development of the future energy system.

Lack of awareness and information

- Many companies are not aware of the potential benefits of energy efficiency measures, or they may not know where to start when it comes to identifying opportunities for improvement.
- Organisational barriers can also hinder the implementation of energy efficiency measures. For example, employees may resist changes to their routines or processes, or there may be a lack of communication between different departments or levels of management.
- Lack of technical expertise can hinder progress on energy efficiency measures, and may be addressed through workforce training and development.

FIGURE 2

Barriers hindering energy efficiency implementation

Priority actions

The White Paper calls for the following priority actions:

- Energy use should be better monitored, and audit recommendations should be implemented.
- Best available practices regarding energy efficiency need to be updated, shared, and implemented.
- The implementation of new energy-efficient innovations, related to energy-efficient feedstock, processing, and waste heat reuse/reduction, should be supported by regulations and financial incentives.
- A level playing field should be ensured for low-emission industries.
- The development of new energy-efficient technologies should be stimulated.
- Long-term decarbonisation plans should be made and aligned among policymakers, energy network companies, and the industry.

To download a copy of the White Paper and read about the work of the EERA JP EEIP, follow this link.